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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			HO, ANTHONY	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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DETAILED ACTION

This is in response to amendment to application no. 10/567,929 filed on August 25, 2008.

Claims 1-6, 8-13 and 15-26 are presented for examination.

Claims 15, 19 and 25 stand withdrawn with claim 26 being withdrawn herein.

Claims 7 and 14 have been cancelled.

Election/Restrictions

Newly submitted claim 26 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: see page 2 of the Restriction Requirement dated November 29, 2007.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 26 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “photovoltaic device” must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

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Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-4, 8, 11, 16-17 and 23-24 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ago et al, "Composites of Carbon Nanotubes and Conjugated Polymers for Photovoltaic Devices," Advanced Materials, VCH Verlagsgesellschaft, Weinheim, DE, vol. 11, no. 15, 20 October 1999 (1999-10-20), pages 1281-1285 with support of Ago et al, "Electronic interaction between photoexcited poly(p-phenylene vinylene) and carbon nanotubes," Physical Review B, Vol. 61, No. 3, 15 January 2000, 2286-2290 (teaching reference). In re claim 1, Ago et al (Composites) discloses a photovoltaic device, comprising a composition of carbon nanotubes and of at least one organic compound (Figure 4a; page 1284, column 2, lines 42-43).

Ago et al (Composites) also discloses MWNT as small-gap semiconductors (the activation energy (i.e. band gap) is 3-14 meV (see citation [13] – which incorporates by reference Ago et al, "Electronic interaction between photoexcited poly(p-phenylene vinylene) and carbon nanotubes," Physical Review B, Vol. 61, No. 3, 15 January 2000, 2286-2290)). As long as the band-gap of the carbon nanotube is smaller than the one of the organic hole conductor, a photovoltaic effect will be observed. In addition, the specification of the present application does not mention any unexpected results for a band-gap of 0.5 eV - 1 eV.

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In re claim 3, Ago et al discloses the material used in the device is PPV, which is a conjugated polymer (page 1283, column 1, lines 16-18).

In re claim 4, Ago et al discloses the carbon nanotubes are a mixture of metallic and semiconducting carbon nanotubes (page 1283, column 1, line 14).

In re claim 8, Ago et al discloses the band gap of PPV is 2.4 eV (Figure 4b).

In re claim 11, Ago et al discloses the composition is a two-layer system, wherein the hole conductor is in one layer and the carbon nanotubes are in another layer (Figure 4a; page 12-81, column 2, lines 51-53).

In re claim 16, Ago et al discloses the hole conductor is one of the listed materials, PPV.

In re claim 17, the recitation "An organic solar cell" in the claim preamble specifies an intended use or field of use and is treated as nonlimiting since it has been held that in device claims, intended use must result in a structural difference between the claim invention and the prior art in order to patentably distinguish the claim invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). A claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed

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apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

In re claim 23, the recitation “a combination of the device according to claim 1 with a circuit, wherein the device acts as an internal power supply” in the claim preamble specifies an intended use or field of use and is treated as nonlimiting since it has been held that in device claims, intended use must result in a structural difference between the claim invention and the prior art in order to patentably distinguish the claim invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). A claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

In re claim 24, the recitation “a solar cell” in the claim preamble specifies an intended use or field of use and is treated as nonlimiting since it has been held that in device claims, intended use must result in a structural difference between the claim invention and the prior art in order to patentably distinguish the claim invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the

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claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). A claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Claim Rejections - 35 USC § 103

Claims 2, 6, 9-10, 12-13, 18 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ago et al, "Composites of Carbon Nanotubes and Conjugated Polymers for Photovoltaic Devices," *Advanced Materials*, VCH Verlagsgesellschaft, Weinheim, DE, vol. 11, no. 15, 20 October 1999 (1999-10-20), pages 1281-1285 with support of Ago et al, "Electronic interaction between photoexcited poly(p-phenylene vinylene) and carbon nanotubes," *Physical Review B*, Vol. 61, No. 3, 15 January 2000, 2286-2290 as applied to claim 1 above, and further in view of Kymakis et al, "Single-Wall Carbon Nanotube/Conjugated Polymer Photovoltaic Devices," *Applied Physics Letters*, American Institute of Physics. New York, US, vol. 80, no. 1, 7 January 2002 (2002-01-07), pages 112-114.

In re claim 2, Kymakis et al discloses the first and second electrodes are made of ITO and aluminum (page 113, column 2, line 9).

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with the first and second electrodes are made of ITO and aluminum as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 6, Kymakis et al discloses the carbon nanotubes have a diameter of 1.4 nm (page 112, column 2, line 9).

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with the carbon nanotubes have a diameter of 1.4 nm as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 9, Kymakis et al discloses the LUMO of P3OT is 2.85 eV (page 114, column 1, lines 29-30), its bandgap 2.4 eV (page 113, column 1, line 24), addition of these values results in a HOMO of 5.25 eV which is greater than the HOMO of the carbon nanotubes (page 114, column 1, lines 16-17).

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with the LUMO of P3OT is 2.85 eV, its bandgap 2.4 eV, addition of these values results in a HOMO of 5.25 eV which is greater than the HOMO of the carbon nanotubes as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 10, Kymakis et al discloses the composition comprises a mixture of carbon nanotubes and at least one hole conductor (page 112, column 2, lines 5-17).

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with the composition comprises a mixture of carbon nanotubes and at least one hole conductor as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 13, the term "vertical" is broad and in this case, a portion of the carbon nanotubes in Kymakis et al is vertical with respect to one of the electrodes.

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with a portion of the carbon nanotubes in Kymakis et al is vertical with respect to one of the electrodes as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 18, Kymakis et al discloses the one of the electrodes is a film or layer of a transparent material, ITO.

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with the one of the electrodes is a film or layer of a transparent material, ITO as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 21, Kymakis et al discloses a glass substrate (Figure 1).

The advantage is to be able to obtain organic photovoltaic cells with improved performance (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al

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(Composite) with support of Ago et al (Electronic) with a glass substrate as taught by Kymakis et al in order to obtain organic photovoltaic cells with improved performance.

In re claim 22, it is well known in the art that a flexible polymer substrate is used in organic photovoltaic devices.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ago et al, "Composites of Carbon Nanotubes and Conjugated Polymers for Photovoltaic Devices," *Advanced Materials*, VCH Verlagsgesellschaft, Weinheim, DE, vol. 11, no. 15, 20 October 1999 (1999-10-20), pages 1281-1285 with support of Ago et al, "Electronic interaction between photoexcited poly(p-phenylene vinylene) and carbon nanotubes," *Physical Review B*, Vol. 61, No. 3, 15 January 2000, 2286-2290 as applied to claim 1 above, and further in view of Tsukamoto et al (JP 2003-096313).

Tsukamoto et al discloses the carbon nanotubes are a mixture of multi-walled and single-walled carbon nanotubes (paragraph 0008).

The advantage is to increase the characteristics of a semiconductor device (paragraph 0003 - paragraph 0005).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with the carbon nanotubes are a mixture of multi-walled and single-walled carbon nanotubes as taught by Tsukamoto et al in order to increase the characteristics of a semiconductor device.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ago et al, "Composites of Carbon Nanotubes and Conjugated Polymers for Photovoltaic Devices," Advanced Materials, VCH Verlagsgesellschaft, Weinheim, DE, vol. 11, no. 15, 20 October 1999 (1999-10-20), pages 1281-1285 with support of Ago et al, "Electronic interaction between photoexcited poly(p-phenylene vinylene) and carbon nanotubes," Physical Review B, Vol. 61, No. 3, 15 January 2000, 2286-2290 as applied to claim 1 above, and further in view of Forrest et al (US Patent 6,451,415).

Forrest et al discloses a multilayer structure for photovoltaic devices (Figure 2D).

The advantage is for efficient charge carrier generation (column 8, lines 51-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) with a multilayer structure for photovoltaic devices as taught by Forrest et al in order for efficient charge carrier generation.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ago et al, "Composites of Carbon Nanotubes and Conjugated Polymers for Photovoltaic Devices," Advanced Materials, VCH Verlagsgesellschaft, Weinheim, DE, vol. 11, no. 15, 20 October 1999 (1999-10-20), pages 1281-1285 with support of Ago et al, "Electronic interaction between photoexcited poly(p-phenylene vinylene) and carbon nanotubes," Physical Review B, Vol. 61, No. 3, 15 January 2000, 2286-2290, further in view of

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Kymakis et al, "Single-Wall Carbon Nanotube/Conjugated Polymer Photovoltaic Devices," Applied Physics Letters, American Institute of Physics. New York, US, vol. 80, no. 1, 7 January 2002 (2002-01-07), pages 112-114 as applied to claim 2 above, and further in view of Ganzorig et al, "Alkali metal acetates as effective electron injection layers for organic electroluminescent device," Materials Science and Engineering B, Elsevier Sequoia, Lausanne, Ch, vol. 85, no. 2-3, 22 August 2001 (2001-08-22), pages 140-143.

Ganzorig et al discloses the addition of an LiF, CsF or Li-acetate interlayer between the Al electrode and the organic hole conducting compound layer (Abstract).

The advantage is to lower the work function of the Al layer and thus enhance hole transfer from the organic compound to the Al electrode (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the photovoltaic device as taught by Ago et al (Composite) with support of Ago et al (Electronic) as modified by Kymakis et al with the addition of an LiF, CsF or Li-acetate interlayer between the Al electrode and the organic hole conducting compound layer as taught by Ganzorig et al in order to lower the work function of the Al layer and thus enhance hole transfer from the organic compound to the Al electrode.

Response to Arguments

Applicant's arguments filed August 25, 2008 have been fully considered but they are not persuasive.

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In response to applicant's argument that "nowhere [in Ago et al (Composite)] disclose or suggest carbon nanotubes having a band gap in the range of from about 0.5 to about 1 eV," examiner asserts that Ago et al (Composite) discloses that the MWNTs used are small-gap semiconductors (see page 1283, column 1, line 14) with footnote [13]. Footnote [13] further states "[t]he activation energy [(i.e. band gap)] for the MWNT film was estimated to be 3 - 14 meV." The range of 3 - 14 meV is within the claimed range of about 0.5 to about 1 eV. Thus, the claimed invention is not patentably distinct over the MWNT film used in Ago et al (Composite).

In response to applicant's argument that Ago et al (Composite) describes the MWNT layer as the electrode layer, not the layer intermediate between the two electrodes, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the layer intermediate between the two electrodes) are not recited in at least rejected claim 1. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections

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are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY HO whose telephone number is (571)270-1432. The examiner can normally be reached on M-Th: 10:30AM-9:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. H./
Examiner, Art Unit 2815

/Kenneth A Parker/
Supervisory Patent Examiner, Art Unit 2815